

STATEMENT OF WORK

Terminal Doppler Weather Radar (TDWR)
RF Filter Amplifier (RFFA) Re-host

AJW-144

25 March 2009

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1.0 BACKGROUND

This Statement of Work (SOW) specifies the re-design and manufacture of a RF Filter Amplifier (RFFA). This effort is termed "RFFA re-host." The RFFA is a custom built electronic component within the TDWR receiver and consists of several different discrete components that generate the radar's radio frequencies. It was originally designed in the 1980s and is long overdue for a re-design. The RFFA re-host is a goal of the TDWR Service Life Extension Program (SLEP) as defined by the FAA Joint Resources Council (JRC) approved at the end of FY07, and is required by AJW-144 in order to accomplish its mission of supporting the TDWR program.

2.0 SCOPE

The Contractor shall furnish all labor, materials, parts, supplies, equipment, test equipment, technical data/expertise, and any other incidental items necessary to accomplish the re-design and manufacture of two (2) RFFA units to include a prototype unit and a production unit. The re-design and manufacture of these two RFFA units shall be accomplished in accordance with the requirements reflected in Technical Exhibits 1 and 2 and the remainder of this Statement of Work (SOW).

3.0 CONTRACTOR TASKING/REQUIREMENTS

3.1 Program Management

Throughout the life of the contract, the contractor shall provide a full range of program management support for the FAA, Weather Products Branch AJW-144, in Oklahoma City, OK. Program management tasks include, but are not limited to, the following:

- 3.1.1 Development of Work Breakdown Schedules (WBS), processes, and plans to effectively manage the development and delivery of the RFFA Re-host.
- 3.1.2 Ensure communications with the COTR if there are changes to the overall schedule of WBS.

3.2 Technology Transfer

- 3.2.1 All engineering designs and drawings needed to describe the fabrication and construction of the RFFA assembly itself and the adaptation of each of its programmable constituent components to the TDWR RFFA application shall belong to the FAA at the completion of the contract. [CDRL A001]
- 3.2.2 The contractor shall specify all of the commercial engineering development tools and software used to produce the RFFA re-host so that the FAA may purchase them if desired. [CDRL A002]
- 3.2.3 The contractor shall provide all computer software source code used to develop the RFFA. [CDRL A003]

- 3.2.4 The FAA shall have full intellectual property rights of the RFFA re-host at the completion of the contract in order to provide for future serial production and/or design modification. [CDRL A004] – Contractor shall provide a statement/letter transferring these rights.

3.3 Testing & Acceptance

- 3.3.1 The Contractor shall develop a test plan for both RFFA Re-host units in conjunction with FAA engineers.
- 3.3.2 Factory Acceptance Testing: The minimum factory testing of the RFFA re-host shall be at the contractor's facility for phase noise and frequency tolerance in accordance with the technical requirements.
- 3.3.3 The prototype RFFA re-host unit shall be tested and integrated into the radar at the FAA's TDWR Program Support Facility (PSF) in Oklahoma City, OK.
- 3.3.4 The production RFFA re-host unit will be tested at the TDWR-PSF in Oklahoma City, OK and at another TDWR operational site for a total time of up to 90 days.
- 3.3.5 Final acceptance of both RFFA RE-host units will occur following the completion of successful testing.

3.4 Configuration Management

The contractor shall support the RFFA re-host configuration management by maintaining a list of physical characteristics, software and firmware revisions needed to meet the technical requirements.

3.5 Risk Management

- 3.5.1 The Contractor shall identify RFFA Re-host risks, classify risks as they apply to technical, cost, and schedule impacts, document all risks, and track them to closure. [CDRL A006]

4.0 WARRANTY

The contractor shall provide a warranty of two years from the time of final acceptance.

5.0 SCHEDULE

The RFFA Re-host effort will progress in accordance with the milestones reflected below:

MILESTONE	TIMEFRAME AFTER AWARD	DESCRIPTION	DELIVERABLE	PERCENT COMPLETE
1	1 Month ARO	Kick-Off Meeting	TIM REPORT	10%
2	6 Months ARO	Preliminary Design Review	PDR Report	40%
3	9 Months ARO	Critical Design Review	CDR Report	20%
4	12 Months ARO	Factory Acceptance Test	Factory Acceptance Test Report	10%
5	15 Months ARO	Acceptance Testing	Acceptance Test Report	10%
6	18 Months ARO	Final Delivery	Final Report and RFFA Units	10%

Note that the Contractor will also invoice in accordance with the above milestones – an invoice may be submitted to the Government following completion of each milestone.

- 5.1 Within 1 month of award of contract, a teleconference or meeting to discuss the project and determine information the contractor requires from the TDWR PSF FAA engineers shall be held and a Technical Interface Meeting (TIM) report shall be delivered to the COTR.
- 5.2 Within 6 months of award of contract, a Preliminary Design Review (PDR) at the TDWR PSF will be held in Oklahoma City, OK. The contractor will provide PDR documentation to the COTR.
- 5.3 Within 9 months of award of contract, a Critical Design Review (CDR) at the TDWR PSF will be held in Oklahoma City, OK. The contractor will provide CDR documentation to the COTR.
- 5.4 Within 12 months of award of contract, factory acceptance testing will be held at the contractor's facility. The contractor will provide a Factory Acceptance Test Report.
- 5.5 Within 15 months of award of contract, acceptance testing will be held at the TDWR PSF in Oklahoma City, OK. The contractor will provide an Acceptance Test Report to the COTR.
- 5.6 Within 18 months of award of contract, a final report and final delivery of all items shall be made to the FAA.

6.0 DELIVERABLES

The contractor shall deliver one (1) RFFA Re-host prototype unit and one (1) RFFA Re-host production unit as well as all Contract Data Requirements (CDRLs) defined in Exhibit 3 and throughout this document.

7.0 TRAVEL

7.1 The Contractor shall coordinate any travel with the Contracting Officer and the COTR prior to traveling. All travel shall be funded on a Cost Reimbursement No-Fee (CRNF) basis. A ceiling amount shall be established on the contract that shall not be exceeded.

7.2 The Contractor shall assist in coordinating visits should any FAA Engineers need to travel to the Contractor's facility during the performance of this effort.

8.0 SECURITY

All contractor personnel shall be escorted when on FAA premises.

EXHIBIT 1

1. Description of the RFFA – “As-Is State”:

- a. Generates a Local Oscillator (LO) 5630 MHz – 5680 MHz signal for the receiver down-converter.
- b. Up-converts to generate a single frequency between 5600 MHz – 5650 MHz with a 1 microsecond pulse width, which is pulsed-modulated between 100 Hz – 2000 Hz to drive the TDWR transmitter.
- c. Generates test signals for the receiver.
- d. Generates an RF Pilot Pulse for checking coherency of the receiver.
- e. Performs built-in-test functions.

2. Description of the RFFA Re-host – “To-Be State”:

- a. Have a Mean Time between Failure (MTBF) greater than 50,000 hours.
- b. Use commercially available electronic components.
- c. Manual tuning of operating frequency without the use of a computer.
- d. The RFFA re-host production unit shall be ready for serial duplication of approximately 165 units; must conform to industry standards; and shall be configuration controlled.
- e. The RFFA Re-host must integrate into the TDWR receiver and be compatible with the TDWR Sigmet RVP9.

EXHIBIT 2

Technical requirements for RFFA Re-host Prototype Unit:

- a. Minimum phase noise required of the LO for the RFFA Re-Host:

Offset in Hz	Phase Noise in dBc/Hz
100	-93
1,000	-118
10,000	-125
100,000	-126

- b. There shall be no spurs from the 1 Hz to 100 Hz offset.
- c. Spurs shall be minimized (less than 1 dBc/Hz) from the 100 Hz to 2000 Hz offset.
- d. For offsets beyond 2000 Hz, low-level (less than 2 dBc/Hz) spurs are permissible.
- e. Oscillator frequency tolerance shall be less than ± 2 parts per million.
- f. The IF frequency tolerance shall be less than ± 5 KHz.
- g. The LO frequency tolerance shall be less than ± 5 Hz.
- h. The frequency tolerance of the RFFA shall be the same as the TDWR receiver at ± 40 parts per million.
- i. The requirements of items 1 through 7, above, shall be met over an ambient temperature range of $+10^{\circ}\text{C}$ to $+60^{\circ}\text{C}$.
- j. The RFFA Re-host shall have an MTBF greater than 50,000 hours.
- k. A Direct Digital Synthesis (DDS) implementation shall be used that will incorporate modern digital-to-analog converters.
- l. The user shall be able select the operating frequency without the use of a computer between 5600 MHz – 5650 MHz in 1 MHz increments.
- m. The crystal oscillators used to generate the source frequency shall be reduced aging crystal oscillators.
- n. The RFFA re-host shall be form-fit-function compatible with existing legacy RFFA and shall have a similar chassis for cabinet mounting. This includes having identical external mechanical dimensions and utilizing existing power supplies provided by the Digital Signal Processor / Receiver Exciter (DSP/REX) cabinet. The legacy RFFA specifications are described in FAA Technical Instruction Books (TIB) 6315.2.
- o. The RFFA re-host shall have all of the same connectors as the legacy unit and shall have an additional 50 Ohm coaxial connector for the LO port.

- p. The RFFA re-host shall be designed to have an output for a reference clock between 7.5 MHz to 100 MHz to provide the Sigmet RVP9 an external master reference.
- q. The RFFA re-host shall be designed to have a USB port to the embedded DDS controller for depot or engineering level maintenance.
- r. The RFFA re-host shall have the ability to withstand an industrial RF environment.
- s. The RFFA re-host shall have the ability to interface into the Sigmet RVP9 signal processor for automatic control.
- t. The RFFA re-host shall have the ability for pulse compression.
- u. The RFFA re-host shall have the ability to use multiple pulse repetition frequencies for different operating frequencies.
- v. The RFFA re-host shall have the ability for frequency agility. This is operating frequency hopping between 5600 MHz – 5650 MHz.

EXHIBIT 3**CONTRACT DELIVERABLES****CONTRACT DATA REQUIREMENTS LIST (CDRLS)**

The Contractor shall provide all of the following documents during the course of the contract at the frequency noted in the table below:

CDRL NUMBER	DESCRIPTION	Frequency of Submission – to COTR or CO	Not separately priced (NSP) or Separately Priced (SP)
A001	Engineering Designs/Drawings (SOW 3.2.1)	Within 18 months following award of contract – to COTR and CO	NSP
A002	List of Commercial Engineering Development Tools and Software used to develop RFFA RE-host (SOW 3.2.2)	Within 18 months following award of contract – to COTR and CO	NSP
A003	Computer Software Source Code used in RFFA Re-host development (SOW 3.2.3)	Within 18 months following award of contract – to COTR and CO	NSP
A004	Intellectual Property Rights Letter (SOW 3.2.4)	Within 18 months following award of contract – to COTR and CO	NSP
A005	RFFA Re-host Test Plan (SOW 3.3.1)	After development - requested by the COTR	NSP
A006	Risk Management Plan (SOW 3.5)	30 days following contract award – to COTR and CO	NSP
A007	Technical Interface Meeting (TIM) Report (SOW 5.0)	Within 5 days following Kick-off Meeting – to COTR and CO	NSP
A008	Preliminary Design Review (PDR) Report (SOW 5.0)	To be delivered at PDR meeting within 6 months following contract award – to COTR and CO	NSP
A009	Critical Design Review (CDR) Report (SOW 5.0)	To be delivered at CDR meeting within 9 months following contract award – to COTR and CO	NSP
A010	Factory Acceptance Test Report	Within 12 months following contract award – to COTR	NSP
A011	Configuration Management Report/Documentation (SOW 5.0)	Within 18 months following contract award – to COTR and CO	NSP
A012	Acceptance Test Report (SOW 5.0)	Within 15 months following award of contract – to COTR and CO	
A013	Final Report (SOW 5.0)	Within 18 months following award of contract – COTR and CO	NSP
A014	Technical or other Reports	At the request of the COTR or CO	NSP